Purpose	To define common terms in reference to infant formulas
Amino Acids	Amino acids are proteins that are broken down into particles that are easy to digest and less likely to cause an allergic reaction than intact, or "whole" protein such as milk or soy protein. They are used in formulas designed for malabsorption and protein allergy.
Casein and Hydrolyzed Casein	Casein is a milk protein or the curds after milk clots. Hydrolyzed casein is milk protein that has been broken down or "predigested" to provide an easily digested high quality protein that is unlikely to trigger an allergy.
Cow's Milk Allergy	Cow's milk has long been a common cause of allergic disease in infants. In sensitive children it causes gastrointestinal difficulties such as vomiting, diarrhea, colic, or respiratory and skin problems. The problem is generally identified by clinical symptoms, family history, and a trial on a milk-free diet. The trial is conducted using a substitute formula such as a soybean formula. Often symptoms appear and disappear spontaneously, regardless of dietary changes, making diagnosis difficult. Symptoms tend to be more often caused by food if gastrointestinal problems are present. Symptoms can be confused with lactose intolerance instead of a milk allergy. All lactose-free formulas are not milk free. Soy formulas are both milk free and lactose free. Some children are allergic to both cow's milk and soy protein. Older children are often able to tolerate cow's milk later.
Elemental Formula	A nutrition support formula composed of simple elemental nutrient components that require no further digestive breakdown and are thus readily absorbed; formulas with the protein as free amino acids and the carbohydrate as the simple sugar glucose.
Enteral Feeding	A mode of feeding that uses the gastrointestinal tract; oral or tube feeding.
Food Allergy	An adverse reaction to foods involving an immune mechanism. The actual chain of events in the body that triggers an allergic reaction is caused by the union of protein substances known as antibodies, with particles from foreign substances, leading to the release of a chemical called histamine. The usual type of allergy is manifested by mild varied symptoms delayed

Food Allergy (cont.)	hours or days after eating. Urticaria, wheezing, asthma, abdominal pain, vomiting, diarrhea, and coma may occur when the highly sensitized patient develops prompt and violent symptoms.
Glucose	Glucose is a simple form of sugar that is easily absorbed by the body. Glucose is used in formulas designed for infants with allergies to more complex carbohydrates, such as corn syrup solids and for problems with malabsorption.
Glucose Polymers	Glucose polymers are particles of complex carbohydrates designed for malabsorption or carbohydrate intolerance. Glucose polymers are bland, easy to digest, and unlikely to trigger carbohydrate allergy.
Hydrolysate	A hydrolysate is a substance broken down by water process (hydrolysis) to make it easier to digest and less likely to cause an allergy. Hydrolyzed casein (casein hydrolysate) and soy protein are two examples of hydrolysates.
Intestinal Solute Load	Because the intestine is a semipermeable membrane, rapid introduction of a high-solute (osmolar) load results in a shift of water from the bloodstream into the lumen of the bowel, causing diarrhea. Because the infant is particularly prone to osmotic diarrhea, care must be taken not to select a formula with high osmolality. If an elemental formula with a high osmolality must be used, it should be carefully introduced to allow the bowel to adapt.
Iron-Fortified Formula	This is formula fortified with approximately 12 milligrams of iron per quart. The WIC Program's requirement for iron-fortified formula is 10 milligrams of iron per liter.
Lactose	Lactose is the sugar, or carbohydrate, in cow's milk.
Lactose Intolerance	Lactose intolerance is a reaction to the milk sugar, lactose, which occurs when the body lacks the enzyme lactase used to digest lactose. The first symptoms of intolerance, diarrhea, bloating, and discomfort, occur after feeding with milk or milk formula. Constipation can sometimes be a symptom. The intolerance may be present at birth (rare) or acquired with age and is most common in Black, Hispanic, Asian, American Indian children, and adults. It is almost non-existent in White preschoolers. An intolerance may also occur after a viral infection or bacterial gastrointestinal infection when there is prolonged diarrhea or long-term use

Lactose Intolerance (cont.)	of antibiotics. Lactase may be the last enzyme to return after recovery from an illness.
L-Methionine	An essential amino acid added to infant formulas to enhance the quality of the protein.
Long Chain Fatty Acids (DHA and ARA)	DHA (docosahexaenoic acid) and ARA (arachidonic acid) are long chain fatty acids which appear to have important roles in infant development, especially of the retina and the brain (*Prog Lipid Res.* 2001.) Infant formula manufacturers have added these long chain fatty acids to most infant formulas. The DHA and ARA added to infant formulas is not derived from fish or animal fat but from microorganisms.
Low-Iron Formula	Low-iron formula contains approximately 6 milligrams of iron per quart or about one half the iron in iron-fortified formula.
MCT Oil	MCT is an abbreviation for medium chain triglycerides. MCT oil is absorbed in the intestine rather than in the liver where fat is usually absorbed. For this reason, it is used in formulas such as Portagen, designed for infants and children who have difficulty absorbing fat, such as with biliary atresia.
Megaloblastic Anemia	This anemia results from a lack of folic acid and/or vitamin B_{12} in the diet. It is common in infants who drink unfortified goat's milk, which is low in folic acid, B_{12}, and vitamin C, who do not have other sources of these nutrients in their diet.
Milk Intolerance	Cow's milk intolerance may mean an allergy to cow's milk protein or a lactase deficiency. (See Lactose Intolerance and Cow's Milk Allergy.)
Osmolality	Refers to the number of osmoles of the particles (solutes) in a kilogram of solvent. It is generally expressed as milliosmoles (mOsm), a measure of osmotically active particles per kilogram of water. • Osmolality of each formula is helpful when comparing formulas or approving a formula for infants and young children or any person with a health condition that may require a low renal solute load or fluid restriction • The osmolality of blood serum and other body fluids should normally be no greater than 300 mOsm/kg of water. The body attempts to keep the osmolality of the contents of the stomach and intestine at this level.

Osmolality (cont.)

- At a given concentration, the smaller the particle size the greater the number of particles present and therefore the higher the osmolality. Simple sugars or low molecular weight carbohydrates increase osmolality of solutions much more than complex carbohydrates with higher molecular weights and large particle size.
- Fats, which are complex and water insoluble, do not increase the osmolality of solutions. Electrolytes, such as sodium and potassium, and amino acids, all contribute significantly to the osmolality of a solution or liquid feeding.

The American Academy of Pediatrics recommends that infant formulas not exceed 450mOsm/kg water, and ideally approximate that of human milk (277-303 mOsm). In milk and soy based formulas minerals and carbohydrates are the main determinants of osmolality. Solutions of high osmolality may draw water into the small intestine, causing diarrhea and possible dehydration and electrolyte imbalance.

Renal Solute Load

Solutes excreted by the kidney comprise the renal solute load. It consists primarily of nitrogenous waste products and electrolytes. Water is required to excrete these materials, which include urea, sodium, potassium, chloride, and to a lesser extent sulfates and phosphates. Each gram of protein ingested contributes about 4 mOsm of renal solute and each milliequivalent of sodium, potassium, and choloride 1 mOsm. The kidneys use water to excrete the metabolic waste. Because insensible water loss (i.e., usual loss through the lungs, skin, and urine) requires at least half of the ingested water of an infant, nothing is left to cover increased loss of water in situations such as sweating, diarrhea, fever, and so on. This makes the infant very vulnerable to fluid and electrolyte abnormalities if fed substances with a high renal solute load such as cow milk.

Whey

A protein in milk. The clear fluid left after the milk clots is whey.

Whey to Casein Ratio

Ratio of whey to casein in human milk is 60:40, compared with a 20:80 ratio in cow's milk.

References

S.R. Williams, Nutrition and Diet Therapy, 1989, pp. G2-G19
E.B. Feldman, Essentials of Clinical Nutrition, 1988, pp. 182-190
American Dietetic Association, Handbook of Clinic Dietetics, 1981, pg. I47
P.Pipes, Nutrition in Infancy and Childhood 1985, pg. 287

**Adapted from the Colorado WIC Program*